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REPORT - HYDROGEN EQUIPMENT MAINTENANCE - ARCS1 (Manus Is.
PNG)

05 - 10TH September 2001

INTRODUCTION

1. During the scheduled maintenance visit by the Bureau of Meteorology (Grant Jeffrey and Troy Culgin), work was carried out as listed below. The Hydrogen Generator and Remote Balloon Launcher (RBL) scheduled maintenance was carried out and this equipment is operating satisfactorily. Additionally, the gas distribution system was altered to allow the use of commercial gas cylinders with the RBL and a trial of balloon gas was commenced.

HYDROGEN GENERATOR

2. The following Hydrogen Generator scheduled maintenance was carried out:

- Air filter cleaned
- Air intake screen cleaned.
- Manometer fluid levels checked and adjusted.
- Coalescing filter element changed
- Compressor overhauled - cylinder replaced, broken oil ring replaced.
- Compressor oil changed
- Compressor pump-down time checked OK - 3 min 46 seconds into 600 Kpa (the best it's ever been)
- Fan bearings oiled
- Compressor drive belt replaced (action item from last visit).
- Water prefilter element replaced
- Purge timer checked OK - 1 min 1 second.
- High pressure cut-off switch checked OK - 700 KPa
- Gasholder level switches S13, S14 and S15 checked OK
- Demineraliser cartridges OK. (first one half used - check in October)
- Cell specific gravities checked OK
 - cell 1; 1280, cell 2; 1285, cell 3; 1290, cell 4; 1290, cell 5; 1300.
- Moisture vented from storage tanks
 - No 1; 10mL, No 2; a few drops, No 3 and 4 ; nil

- Gas holder and cells have no leaks
 - Compressor crankcase ventilation non return valve spring removed as this is standard.
 - All gas fittings checked for leaks
 - Hydrogen generator cleaned and all rusty metal work sanded and painted
 - Wind sail switch check for correct operation - OK
 - Idle mode checked - OK
 - Rectifier over current trip checked - OK
 - Indicator lights and meters checked - OK
 - Teledyne Gas Analyser battery, fittings and calibration checked - OK.
3. Faulty compressor head (removed by Kim Nitschke in August) repaired.
 4. Large quantity of compressor spares added to spares inventory.
 5. Operational water pump air pressure checked by observation of run time after shut off of water flow.
 6. Spares inventory check carried out - results at paragraph 13 below.

REMOTE BALLOON LAUNCHER

7. The RBL hydrogen regulator was replaced with a new unit (action from previous visit).
8. The following Remote Balloon Launcher scheduled maintenance was carried out:
 - Operation and condition of lights, switches, curtains, doors, release mechanism and release cable checked - OK.
 - Gas fittings and hoses checked for condition and leaks - OK
 - Flow rate checked - 100Kpa at balloon nozzle, 150kpa at regulator.
 - Earthing and bonding checks carried out
 - Balloon shed lighting timer adjusted to correct time again. However, this has been switched to bypass mode, as it continually falls out of step due to many power interruptions. In any case it is not required as staff are aware they must limit the use of balloon shed lights at night to avoid pick up by the WSI.
9. Spares check carried out - results at paragraph 13 below.

GAS DISTRIBUTION SYSTEM ADDITIONS

10. Completed works: The Gas Distribution System was modified to enable the use of commercial gas cylinders with the RBL as an alternate to the hydrogen generator storage. Initially this has the Helium regulator attached. A Comet 750 hydrogen regulator complete with flashback arrester has been supplied and can

be readily attached in place of the helium regulator. An earth stake and cable has been installed in readiness for the cylinder racks.

11. Outstanding works and items:

- The cylinder wall brackets, earth stake clamp and flexible earth cable and clamp assembly were not available in time for this visit and these should be on site by the next reset visit in October - Action; Grant J.
- The wall brackets and earth cable assembly are to be installed at next reset visit. - Action; Troy Culgin
- The spare Comet 750 regulator, spare flexible braided hose and spare 3 way valve will also be supplied when available from BOC in Melbourne - Action; Grant J.
- Hydrogen cylinder valve key to be supplied (for cylinders that require a key) – Action - Grant J.

BALLOON GAS TRIAL

12. ARCS 1 staff were instructed in the use of commercial helium with the RBL. Flights using balloon gas (low grade helium with up to 10% other gasses) were commenced to determine the usefulness of this gas as a backup for the hydrogen generator gas supply. Staff have recorded the results on their paperwork, indicating the use of balloon gas, fill time, height at 10 minutes and pressure at burst. At my departure, fill time to achieve 3000 Metres altitude at 10 minutes was determined to be about 4 minutes 35 seconds. The fill time for hydrogen to achieve the same ascent rate is 3 minutes 10 seconds. Ascent rates varied considerably for the same volume of gas depending on the presence of cloud and precipitation and staff were simply adding more time (5 to 10 seconds) to compensate in such conditions. One cylinder of balloon gas was providing for about 3.5 flights. At time of departure there were three cylinders of balloon gas remaining.

HYDROGEN GENERATOR AND RBL SPARES STOCK TAKE

13. Hydrogen generator and RBL spares inventory as at 10 Sept 2001 is as follows:

BOM Catalogue No.	Description	Establishment	Quantity on hand
455507	Lubricating oil - compressor	4	4
NIV	Compressor V belt A49	1	1
454256	Gasket - compressor head	2	1
454387	Head comprssr - c/w suction & dischrq valves	1	2
454395	Bearing roller tapered, compressor drive end	1	1
454416	Bearing roller tapered, compressor plain end	1	1
454299	Cylinder, compressor.	1	1
451434	Disc, suction valve.	1	1

451442	Disc, discharge valve	1	2
454256	Gasket, compressor head	2	0
454280	Gasket, compressor inspection cover	1	2
454264	Gasket, crankshaft bearing plate.	1	1
454272	Gasket, compressor cylinder to crankcase	1	2
451389	Gasket, rnd - bmper plt comprsr suction valve	1	1
451370	Gasket, rnd - setsrw comprsr dischg valve	1	1
451397	Gasket rnd - comprsr suction valve cover	1	2
451418	Gasket rnd - comprsr discharge valve cover	1	1
453202	Gasket rnd - comprsr discharge valve seat	1	1
453157	Nut, dome - comprsr discharge valve	1	1
453288	Comprsr dischg valve assembly complete	1	1
453261	Comprsr suction (inlet) valve assmby cmplt	1	1
454328	Seal, plain - compressor drive shaft	1	1
453296	Seat, valve - compressor discharge	1	1
451426	Setscrew - compressor discharge valve	1	1
454379	Shim 0.005" - compressor cover plate	1	1
454344	Shim 0.010" - compressor cover plate	1	1
454360	Shim - compressor connecting rod	2	2
454301	Spring, helicl comprsr -comprsr dischg valve	1	1
466310	Cable electrical - cell jumper leads	2	2
454029	Cell assembly - 250 amp	0	0
469335	Control module, current monitoring c/w regltr	1	1
459954	Filter material - aspirator assembly	2	1
459700	Filter elem fluid - coalescing comprsr relief	2	0
457270	Filter elem fluid - fibre cylindrical w/o container	4	4
453181	Filter elem air - rectifier cabinet intake	4	4
455339	Filter elem, demineralising - 3" dia. x 20" long	4	3
457967	Fuse cart fast acting - current limiting 5 a 600 v	2	2
462395	Fuse current limiting indicating - 150 a 240 v	4	4
246625	Leak test compound	2	2
459583	O' ring eth. prop. - cell SG plugs	5	5
364883	O' ring eth. prop. - compressor oil fill plug	1	0
464470	O' ring eth. prop. - oxygen sampling ports	10	10
463558	O' ring eth. prop. - vent tube end connectors	10	10
459604	O' ring eth. prop. - "Swagelok" fittng water vlve	5	5
466265	Plug blanking PVC - O2/H2 manifolds	2	2
466257	Plug blanking "Swagelok"	1	1
466505	Potassium hydroxide flake - technical grade	10Kg	25
Kgs			
465107	Regulator - control module	1	1
465094	Relay magnetic 12VDC - control module	1	1
457377	Relay timer electromagnetic - 120 VAC 2C	1	1
456999	Resistor variable wirewound - 10K 10% 25W	1	1
455945	Sampling assembly - oxygen aspirator unit	1	2
464606	Bulb neoprene - aspirator assembly	1	1

462512	Semiconductor diode - Normal - 400 vt 130 a	3	4
462520	Semiconductor diode - Reverse - 400 v 130 a	3	5
456403	Sight tube complete	3	3
462731	Sleeve compression - St. St. 3/8" tube	5	10
463427	Sleeve compression - St. St. «" tube	5	0
404312	Syringe hypodermic - manometer fluid	2	3
455937	Tape gas thread sealing	2	2
456745	Tester battery electrolytic - SG 1100/1350	1	2
456411	Tube vent - cell	5	6
459970	Tubing neoprene 1M long - aspirator asmbly	1	1
464585	Valve, check - aspirator assembly	1	1
458978	Vinegar white - 25 Lt container (obtain locally)	1	2litres
199056	Water distilled - 25 Lt container	1	3
244558	Lamp, incandescent	5	5
NIV	coil for K1/K2 contactor	1	1
NIV	Allan Bradley indicator lgt assembly- front pnl	1	1
460840	Adapter strt, pipe to tube, 3/8" tube x «" NPT	1	1
463451	Adapter strt, pipe to tube, «" tube x 1/4" NPT	1	1
457924	Adapter strt PTFE, tube to boss - cell termis	10	10
NIV	Sleeve compression - Brass 1/4" tube	10	28
NIV	clear tube 3/8"	3M	17.5'
NIV	clear tube 1/4"	3M	9'
466257	Plug blanking "Swagelok" 3/8" tube	1	1
NIV	Plug blanking "Swagelok" 1/2" tube	1	1
483831	Plug blanking "Swagelok" 1/4" tube	1	1
484340	Gas Analyser, Teledyne	1	1
484332	Gas Analyser cell	1	1
NIV	Gas analyser batteries	2	2
465748	Fume cartridge	1	0
465721	Gas mask (no filter)	1	1
465756	Coveralls, chemical protective	2	1
227555	Gloves, gauntlet, neoprene coated	1pr	3pr
NIV	Electrolyte mixing container, 50 litre.	1	1
NIV	Manometer fluid bottle (1/3 full)	0	0
NIV	Water pump, Davey XP350H.	1	1
NIV	pump control unit for water tank pump	1	1
NIV	paint- silver enamel (in fume cupboard)	1L	1.5L
NIV	mineral turps	500mL	0ml
NIV	paintbrush (in fume cupboard)		1
NIV	emery paper sheet 360 grit		1
NIV	fibreglass flywire screen gauze		2'x2'
NIV	box spanner for cell fittings	1	1
NIV	water pipe fittings (various)		

RBL STOCK TAKE

NIV	Pressure bleed hose assembly	1	1
469896	warning light	1	1
477490	Pressure gauge 0-160kPa with hose and fitgs	1	1
NIV	RBL fluro light ballast	1	1
NIV	access kit for Hazardous Area Light	1	2
477116	Balloon Table Hydrogen Hose Assem	1	1
476770	string unwinder inhibitor cord	5	9
	string unwinder inhibitor block	2	4
476762	string unwinder inhibitor strap	5	4
477538	SWAK gas sealant 6ml tube	1	1
365720	O' ring eth. prop. - hydrogen and helium reg.	10	20
470432	RBL gas nozzle assembly	5	5
470440	RBL gas nozzle point	5	5
364779	RBL gas nozzle O-ring	5	5
	gloves, cotton	2	4
171926	flashcoats	2	4
	goggles, safety	2	2
	gloves, disposable latex	2	10

RECOMMENDATIONS/ACTION ITEMS

14. It is recommended that the following spares be replenished/added:

- Qty two sheets of oil jointing gasket material for head gaskets, NIV from Repco or other.
- Qty one electrical cabinet air filter carrier, stainless steel.
- Qty one compressor oil fill plug O-Ring, Cat No. 364883. (ordered 13 Sept 01, req. No.)
- Qty two Fume cartridges, Cat No. 465748. (on order since 06 August 01, SAP Req. No. 411)
- Qty five « 1/2 inch Swagelok compression sleeves Cat No. 463427

15. The gas storage cylinders are due for testing. Action - BOM. when replacements available.

16. Thanks to Francis, Mary, James, Hymson, Troy and others for their great help during the visit.

Grant Jeffrey
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Bureau of Meteorology
13 Sept 2001